Dataset Expocode	**33HH20160517**
Primary Contact	**Name:** Sullivan, Kevin **Organization:** NOAA/Atlantic Oceanographic & Meteorological Laboratory **Address:** 4301 Rickenbacker Causeway **Phone:** 305-361-4382 **Email:** Kevin.Sullivan@noaa.gov
Investigator	**Name:** Wanninkhof, Rik **Organization:** NOAA/Atlantic Oceanographic & Meteorological Laboratory **Address:** 4301 Rickenbacker Causeway, Miami Fl, 33149 **Phone:** 305-361-4379 **Email:** Rik.Wanninkhof@noaa.gov
Dataset	**Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program **Initial Submission (yyyymmdd):** 20160622 **Revised Submission (yyyymmdd):** 20160622
Campaign/Cruise	**Expocode:** 33HH20160517 **Campaign/Cruise Name:** HB1601-Leg3 **Campaign/Cruise Info:** AOML_SOOP_CO2, Spring Bottom Trawl Survey **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** Research Cruise **Vessel Name:** R/V Henry B. Bigelow **Vessel Owner:** NOAA **Vessel Code:** 33HH
Coverage	**Start Date (yyyymmdd):** 20160517 **End Date (yyyymmdd):** 20160605 **Westernmost Longitude:** 71 W **Easternmost Longitude:** 65.7 W **Northernmost Latitude:** 44.5 N **Southernmost Latitude:** 40.8 N **Port of Call:** Boston, MA
Variable	**Name:** xCO2_EQU_ppm **Unit:** ppm **Description:** Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)
Variable	**Name:** xCO2_ATM_ppm **Unit:** ppm **Description:** Mole fraction of CO2 measured in dry outside air (ppm)
Variable	**Name:** xCO2_ATM_interpolated_ppm **Unit:** ppm **Description:** Mole fraction of CO2 in outside air associated with each water analysis. These values are interpolated between the bracketing averaged good xCO2_ATM analyses (ppm)
Variable	**Name:** PRES_EQU_hPa **Unit:** hPa **Description:** Barometric pressure in the equilibrator headspace (hPa)
Variable	**Name:** PRES_ATM@SSP_hPa **Unit:** hPa

	Description: Barometric pressure measured outside, corrected to sea level (hPa)
Variable	**Name:** TEMP_EQU_C **Unit:** Degree C **Description:** Water temperature in equilibrator (°C)
Variable	**Name:** SST_C **Unit:** Degree C **Description:** Sea surface temperature (°C)
Variable	**Name:** SAL_permil **Unit:** ppt **Description:** Sea surface salinity on Practical Salinity Scale (o/oo)
Variable	**Name:** fCO2_SW@SST_uatm **Unit:** µatm **Description:** Fugacity of CO2 in sea water at SST and 100% humidity (µatm)
Variable	**Name:** fCO2_ATM_interpolated_uatm **Unit:** µatm **Description:** Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (µatm)
Variable	**Name:** dfCO2_uatm **Unit:** µatm **Description:** Sea water fCO2 minus interpolated air fCO2 (µatm)
Variable	**Name:** WOCE_QC_FLAG **Unit:** None **Description:** Quality control flag for fCO2 values (2=good, 3=questionable)
Variable	**Name:** QC_SUBFLAG **Unit:** None **Description:** Quality control subflag for fCO2 values, provides explanation when QC flag=3
Sea Surface Temperature	**Location:** After sea water pump, ~3 m below sea surface **Manufacturer:** Seabird, Inc. **Model:** SBE 38 **Accuracy:** 0.001 (°C if units not given) **Precision:** 0.0003 (°C if units not given) **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision; Maintained by ship.
Sea Surface Salinity	**Location:** In dry lab after a debubbler, next to CO2 system **Manufacturer:** Seabird **Model:** SBE 45 **Accuracy:** ± 0.005 o/oo **Precision:** 0.0002 o/oo **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision; Maintained by ship.
Atmospheric Pressure	**Location:** On mast above the bridge at ~35 m above sea surface water **Normalized to Sea Level:** yes **Manufacturer:** Vaisala **Model:** PTB220 **Accuracy:** ± 0.15 hPa (hPa if units not given) **Precision:** 0.01 hPa (hPa if units not given)

Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Atmospheric CO2

Measured/Frequency: Yes, 5 readings in a group every 3.5 hours
Intake Location: Mast above the bridge, ~35 meters above sea surface
Drying Method: Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).
Atmospheric CO2 Accuracy: ± 0.5 µatm in fCO2_ATM
Atmospheric CO2 Precision: ± 0.01 µatm in fCO2_ATM

Aqueous CO2 Equilibrator Design

System Manufacturer:
Intake Depth: 3 meters
Intake Location: Bow
Equilibration Type: Spray head above dynamic pool with thermal jacket
Equilibrator Volume (L): 0.95 L (0.4 L water, 0.55 L headspace)
Headspace Gas Flow Rate (ml/min): 70 - 150 ml/min
Equilibrator Water Flow Rate (L/min): 1.5 - 2.0 L/min
Equilibrator Vented: Yes
Equilibration Comments: Primary equilibrator is vented through a secondary equilibrator.
Drying Method: Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

Aqueous CO2 Sensor Details

Measurement Method: IR
Method details: details of CO2 sensing (not required)
Manufacturer: LI-COR
Model: 6262
Measured CO2 Values: xco2(dry)
Measurement Frequency: Every 140 seconds, except during calibration
Aqueous CO2 Accuracy: ± 2 µatm in fCO2_SW
Aqueous CO2 Precision: ± 0.01 µatm in fCO2_SW
Sensor Calibrations:
Calibration of Calibration Gases: The analyzer is calibrated every 3.5 hours with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO scale. The zero gas is ultra-high purity air.
Number Non-Zero Gas Standards: 4
Calibration Gases:

Std 1: JA02166, 232.80 ppm, owned by AOML, used every ~3.5 hours.
Std 2: JB03651, 306.46 ppm, owned by AOML, used every ~3.5 hours.
Std 3: JB03591, 409.69 ppm, owned by AOML, used every ~3.5 hours.
Std 4: JB03285, 565.58 ppm, owned by AOML, used every ~3.5 hours.
Std 5: 0.00 ppm, owned by AOML, used every ~17.0 hours.
Comparison to Other CO2 Analyses:
Comments:
Method Reference:
Pierrot, D., C. Neil, K. Sullivan, R. Castle, R. Wanninkhof, H. Lueger, T. Johannessen, A. Olsen, R. A. Feely, and C. E. Cosca (2009), Recommendations for autonomous underway pCO2 measuring systems and data reduction routines, Deep-Sea Res II, 56, 512-522.

Equilibrator Temperature Sensor	**Location:** Inserted into equilibrator ~5 cm below water level **Manufacturer:** Hart **Model:** 1523 **Accuracy:** 0.015 (°C if units not given) **Precision:** 0.0003 (°C if units not given) **Calibration:** Factory calibration **Comments:** Resolution is taken as Precision.
Equilibrator Pressure Sensor	**Location:** Attached to equilibrator headspace. Differential pressure reading from Setra 239 attached to the equilibrator headspace is added to the pressure reading from the LICOR, which is measured by an external Setra 270 connected to the exit of the analyzer. **Manufacturer:** Setra **Model:** 270 **Accuracy:** 0.15 (hPa if units not given) **Precision:** 0.015 (hPa if units not given) **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision.
Additional Information	**Suggested QC flag from Data Provider:** NA **Additional Comments:** For the first nine days of the cruise, the scrubber tube on the CO2 anlayzer needed to be replenished so the quantity and quality of the data was reduced. Recalculation of the analyzer output allowed recovery of several days of data. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/bigelow/bigelow_introduction.html **Citation for this Dataset:** **Other References for this Dataset:**